

# SEMINAR



# SERIES

北京大学工学院

力学与工程科学系

湍流与复杂系统国家重点实验室

## Local Burning Behavior of Wind-driven Flames Under the Influence of Mixed-Convective Turbulent Flow Conditions – Development of a Unified Local Mass Burning Rate Correlation

报告人: Ajay V. Singh

时 间: 7月2日 周二 下午 14:00

地 点: 新奥工学大楼 3048 会议室

主持人: 王圣凯 助理教授



报告内容摘要:

Experiments were conducted to investigate the burning behavior of wind-driven turbulent fires stabilized over a condensed fuel surface. A controlled turbulent crossflow environment was established to examine the impact of external flow velocity and turbulence intensity on the flame profile parameters and mass burning rates. To address the complexities of practical flame spread scenarios, a mixed-convection parameter  $\xi_x$  in the form of  $Gr_{x1}/\psi_{x2}^n$  was defined, encapsulating the combined effects of momentum, buoyancy, and flow turbulence. Furthermore, the property of fuel (in terms of mass transfer number  $B$ ) was integrated into the mixed-convection parameter ( $\xi_x$ ) to establish a fuel-dependency factor within the formulation. The interdependence of flame characteristics and the mass burning process was observed using  $\xi_x$ , that yielded several meaningful correlations. In this regard, a power-law trend was obtained between flame standoff distance and the dimensionless parameter  $\xi_x$ . Finally, the local mass burning rates were estimated and plotted against the mixed-convective parameter ( $\xi_x$ ), resulting in a unified local mass burning rate correlation. This correlation incorporates the fuel dependency aspect in its formulation and applies to both laminar and turbulent crossflow Environments.

报告人简介:

Dr. Ajay V. Singh is an Associate Professor in the Department of Aerospace Engineering at the Indian Institute of Technology Kanpur, India. He received a Ph.D. in Mechanical Engineering from the University of Maryland, College Park, USA (2015), and did postdoctoral research at Stanford University, Stanford, USA (2015-2017).

His professional achievements include the Exemplary Performance in Teaching Award (2024, 2023, and 2019), two Best Paper Awards in the field of fluid, thermal, and energy systems at the 2nd International Conference on Fluid, Thermal and Energy Systems - ICFTES'24 (2024), two Best Paper Awards in the field of chemically reacting flows at the 2nd International Conference on Recent Advances in Fluids & Thermal Sciences - iCRAFT2020 (2021), Commendation letter from the Academic Senate of IIT Kanpur for publishing research in the Proceedings of the National Academy of Sciences (PNAS) USA (2019), Early Career Research Award (2019), Outstanding Reviewer Award from the Combustion Institute (2018), New Faculty Fellowship (2017-2020), Distinguished Paper Award in the 35th International Symposium for Combustion (2014) and a nomination for the Silver Combustion Medal (2015) which recognizes an outstanding distinguished paper. A distinguished paper selected for this honor exemplifies quality, achievement, and significance in advancing the field of combustion science. His academic achievements also include a Future Faculty Fellowship from the University of Maryland College Park (2014-2015), Northrop Grumman Graduate Fellowship in Engineering Education (2014-2015), Outstanding Graduate Assistant Award (2014-2015), and the prestigious Jacob K. Goldhaber travel award (2015).

His current research interests are in fire science, fire dynamics, flame spread, high-speed compressible reactive flows, gaseous detonations including deflagration to detonation transition (DDT) in channels and tubes, gaseous explosions, soot formation and oxidation in flames, and flame synthesis of functional nanoparticles. So far, he has published his work in about 111 reputed International Journals and refereed Conference Proceedings. He is also the author of 6 Book Chapters. He is currently a reviewer for several reputed journals including Progress in Energy and Combustion Science, Proceedings of the Combustion Institute, and Combustion and Flame. He has given several invited lectures at Stanford University as a part of the High-Temperature Gas Dynamics Seminar series and has also served as a member of prestigious international award committees. He has also served as a session chair in the 38th International Symposium on Combustion, Adelaide, Australia, 2021, and the 37th International Symposium on Combustion, Dublin, Ireland, 2018.

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